



*Fish and Wildlife Research 12*

## Status of the American Eider with Special Reference to Northern New England



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By William B. Krohn  
Patrick O. Corr  
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FISH AND WILDLIFE SERVICE  
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*Frontispiece.* Adult female and male American eiders (*Somateria mollissima dresseri*) during the breeding season on the Maine coast. *Photo by S. Woodward.*

# Status of the American Eider with Special Reference to Northern New England

by

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**Abstract.** The American subspecies of the common eider (*Somateria mollissima dresseri*), known as the American eider, nests primarily on coastal islands from central Labrador to southern Maine. Because banding recoveries revealed that groups that nest in different geographic areas use the same wintering areas, we propose managing this subspecies as one unit, termed the western Atlantic eider population. The annual number of *S. m. dresseri* nesting in the mid-1980's was estimated to be 71,000 pairs; approximately 60% of these birds nest in eastern Canada (Quebec = 34%, Nova Scotia = 11%, New Brunswick = 10%, and Newfoundland = 5%) and 40% in Maine. Data are inadequate to assess the rangewide trend in the abundance of these nesters, but periodic surveys from Maine suggest a population increase during 1960-80, which is now stabilizing. American eiders move south in winter, and most birds winter in coastal waters from Nova Scotia to Massachusetts. The number of American eiders wintering annually in the eastern United States, based on aerial counts, increased from approximately 59,000 in the 1960's to more than 126,000 in the 1980's. Most of these eiders are in Maine and Massachusetts, although a few hundred birds are farther south. Although numbers of wintering eiders suggest a population increase, more data are needed on the annual numbers of wintering eiders by subspecies, especially in eastern Canada, to verify an increase. In the United States portion of the American eider's range, the estimated annual harvest increased from 3,300 in the mid-1960's to over 24,000 in the late 1980's. However,

these estimates are based on small samples and thus are of poor reliability. Harvest rate indexes were 5–6% of the estimated annual fall flight in the eastern United States during the 1960's compared with approximately 15% (range: 11–16%) during 1970–80. Although we found no indications that these harvest levels affected the population, restrictive regulations on harvest of inland ducks as opposed to liberal regulations of harvest of sea ducks suggest that hunter interest in American eiders continues to increase. Information on the numbers of American eiders nesting, wintering, and being harvested suggests an average annual fall flight of 311,000 to 376,000 birds in the mid-1980's. Because of the incomplete nature of available data, these figures must be viewed with caution. With increased hunting and coastal development, including the commercial harvesting of the eider's most important foods, more reliable and uniform rangewide data are needed to establish useful management goals for the western Atlantic eider population.

**Key words:** American eider, common eider, New England, population, *Somateria mollissima dresseri*.

The distribution of the common eider (*Somateria mollissima*) is circumpolar. In eastern North America, three subspecies range from the Canadian high arctic to northern New England (Reed 1986). Common eiders, largest of the North American ducks, are marine birds that nest mostly on coastal islands. Adult eiders feed mainly on blue mussels (*Mytilus edulis*), but also eat other marine organisms including crabs, gastropods, and urchins (Korschgen 1976; Parsons et al. 1990).

Eiders were of special concern to the authors of the 1916 Migratory Bird Convention (Boyd 1986). Article IV of this landmark conservation agreement between the United States and Canada (through Great Britain) gave special protection to eiders and wood ducks (*Aix sponsa*). During the late 1880's and early 1900's, eiders were uncommon along the United States portion of the Atlantic coast and wood ducks had declined throughout their range. Today, many species of inland ducks are near or at historic low levels (U.S. Fish and Wildlife Service and Canadian Wildlife Service 1989). In part because of these low populations, the U.S. Fish and Wildlife Service (FWS) and Canadian Wildlife Service (CWS) implemented, in cooperation with other agencies and organizations concerned with waterfowl, the North American Waterfowl Management Plan (Canadian Wildlife Service and U.S. Fish and Wildlife Service 1986). This plan established goals for management of habitats and populations of geese and some species of dabbling and diving ducks, but not for sea ducks such as eiders.

Concurrent with the decline of inland duck populations in the 1980's, hunting regulations became increasingly restrictive. Regulations for sea ducks, in

contrast, remained liberal. For example, the federal framework for hunting ducks inland in Atlantic Flyway states during the 1990–91 season was 30 days with a daily limit of three birds and species-specific restrictions (i.e., only one female mallard [*Anas platyrhynchos*], only one American black duck [*A. rubripes*], and only two wood ducks). In comparison, the sea duck season in Maine lasted from 8 October 1990 to 19 January 1991 (104 days) with a daily limit of seven, all of which could be eiders, scoters (*Melanitta* spp.), or oldsquaws (*Clangula hyemalis*) or a combination. Hunting of sea ducks and the associated liberal regulations are increasingly discussed by outdoor sportswriters (Spartas 1987; Gillelan 1988).

In addition to pressure from hunting, coastal habitats in the eider's southern range are increasingly used by humans for commerce and recreation (Mendall 1976). Thus, assessment of the status of the American subspecies of the common eider (*S. m. dresseri*) in the eastern United States with special attention to northern New England is appropriate. This paper is a formal version and expansion of a preliminary report by Corr et al. (1989). Our objectives here are to:

1. document the numbers of American eiders (*S. m. dresseri*) nesting in coastal Maine, 1907–89;
2. document numbers harvested and wintering in the eastern United States, 1961–88;
3. assess factors potentially affecting American eiders in northern New England, including hunting and habitat changes; and
4. assess the adequacy of current data to manage this subspecies throughout its range (Fig. 1).

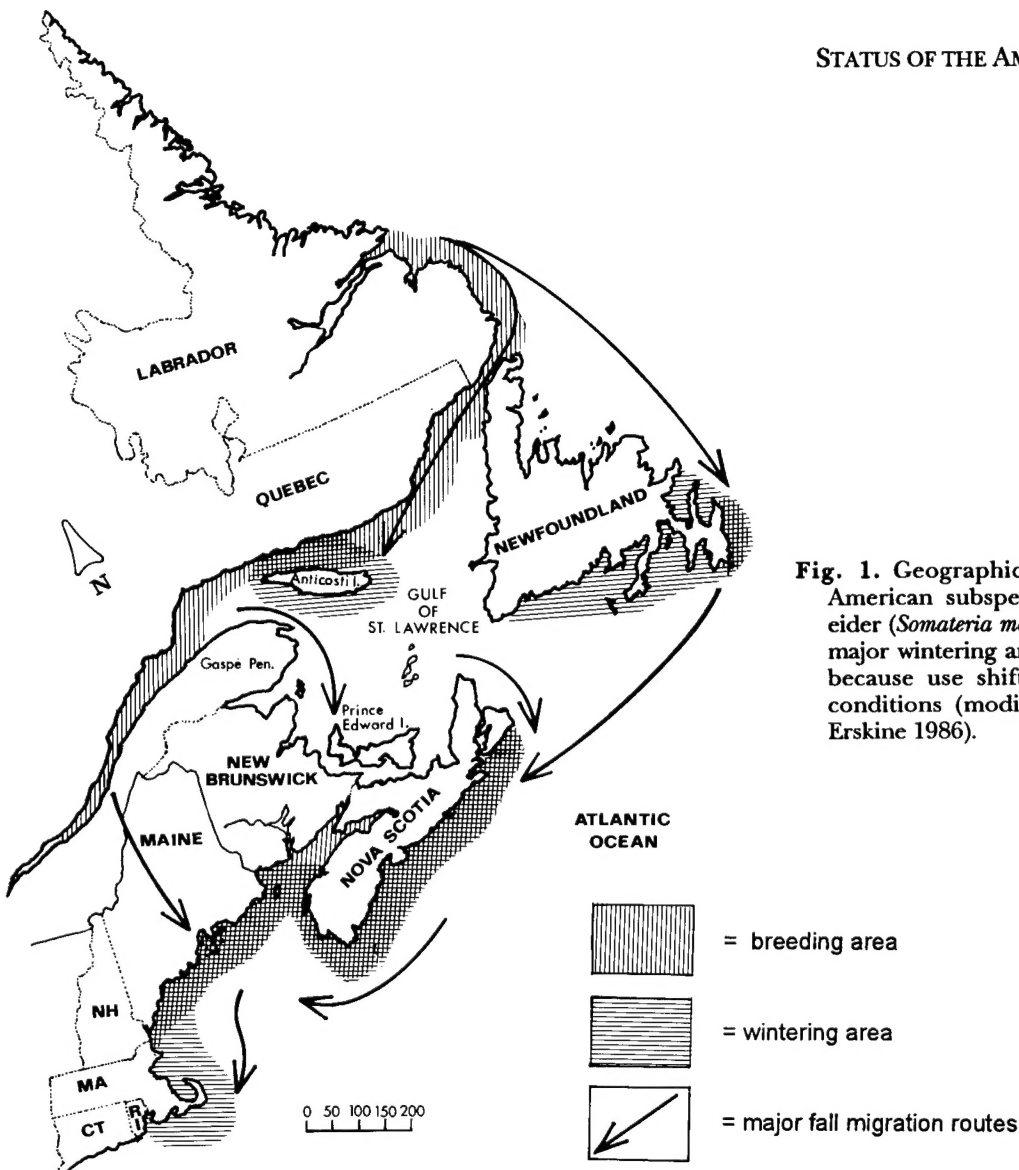


Fig. 1. Geographic distribution of the American subspecies of the common eider (*Somateria mollissima dresseri*). Only major wintering areas in Canada shown because use shifts with changing ice conditions (modified from Reed and Erskine 1986).

## Methods

### Surveys of Nesting Eiders

Norton (1907) and Gross (1944) report early attempts to count eiders nesting in coastal Maine. These initial studies may have underestimated eiders because of poor communication and transportation. Nevertheless, they provide a baseline with which the aerial counts of Mendall (1976) and the boat surveys of Korschgen (1979) could be compared. The 1986 estimate of nesting eiders was from boat surveys by the Maine Department of Inland Fisheries and Wildlife (MDIFW) during the mid-1980's with a method similar to Korschgen's (1979). The 1989 estimate was from aerial counts by MDIFW with a technique similar to Mendall's (1968). The 1972-73 counts of Drury

(1973) were excluded to minimize variation in counts resulting from different survey techniques.

### Mid-Winter Inventory

The U.S. Fish and Wildlife Service, in cooperation with state wildlife agencies, annually counts wintering waterfowl during the first full week of January. In New England, the mid-winter waterfowl survey is done from airplanes and survey locations vary among states. In Maine (and presumably other northeastern states), this survey was designed primarily to inventory American black duck habitats, and thus wintering eiders are not surveyed in all areas they use. In 1980-83, the Maine Department of Inland Fisheries and Wildlife flew over all of Maine's coast and found that  $45 \pm 12\%$  ( $\bar{x} \pm \text{S.D.}$ ;



range: 34–62%) of the eiders along the entire coast were encountered in areas normally included in the winter survey. Survey units in Maine are inspected at 500 feet or less above the water and flight paths cover exposed ledges, island shorelines, and the mainland coast. Lone eiders and small groups (<50) are individually counted, whereas the numbers of individuals in large groups or rafts are visually estimated.

Not all wintering or harvested eiders in Maine are *S. m. dresseri*. Mendall (1980) reported that 6% of a sample ( $n = 1,085$ ) of harvested eiders wintering in Maine, 1966–73, were either northern eiders (*S. m. borealis* = 2%) or intergrades between American and northern eiders (*dresseri-borealis* = 4%). So few king eiders (*S. spectabilis*) winter in Maine that we excluded them from this paper.

Because not all areas used by wintering eiders are inspected each year and because we assume only 94% or so of the birds are *S. m. dresseri* (Mendall 1980), we multiplied mid-winter counts by 2.09 ( $100 \div 45 = 2.22$ ;  $2.22 \times 0.94 = 2.09$ ) for all years except 1980–83 (assumed complete coverage) when the total counts were reduced by 6% (multiplied by 0.94). We made no adjustments for Massachusetts, the other major wintering area of eiders in the eastern United States, because no estimate of coverage has been made and few northern eiders winter there (Moses 1968; Erskine 1990).

Unadjusted counts of wintering eiders in the eastern United States, 1961–84, are from Steiner (1984); data for 1985–88 were obtained from the U.S. Fish and Wildlife Service's Office of Migratory Bird Management in Laurel, Maryland.

### *Survey of Harvests*

The U.S. Fish and Wildlife Service annually mails a questionnaire to a sample of waterfowl hunters to estimate the total number of shot and retrieved birds. In addition, some hunters submit wings from shot birds, and from these wings the species composition of the harvest is estimated (Voelzer et al. 1982). We obtained annual estimates of the retrieved harvest in the Atlantic coast states, 1961–88, from the Office of Migratory Bird Management.

Because most of the eider harvest in Maine occurs during early and mid-season, presumably before the arrival of most northern migrants, harvest estimates

were reduced by only 2% to account for northern eiders and intergrades (Mendall 1980). We did not adjust Massachusetts data, the other major harvest area in the eastern United States, because Moses (1968) reported only one *S. m. borealis* in 171 eiders handled during winter banding operations in Massachusetts, 1966–67.

A harvest rate index of the fall flight of American eiders in the eastern United States was calculated by dividing the size of the harvest by the size of the fall flight (see below). These calculations were based on 4 year means to reduce yearly variation. Assumption for the harvest rate indexes are that essentially all harvest of eiders takes place before the January count and non-hunting mortality of eiders between October and January is negligible.

### *Size of Fall Flights*

The average size of the annual fall flight (= harvest + wintering birds) of *S. m. dresseri* during the late 1980's was estimated by summing estimates of the abundances of breeding adults, non-breeding subadults, and fledged young (= Method I) and summing the sizes of the retrieved harvest and post-harvest (i.e., wintering) populations (= Method II). For Method I, we used the same technique as Reed and Erskine (1986) to estimate the numbers of non-breeders and fledged young. Methods I and II estimate the distribution and numbers of *S. m. dresseri* in the mid-1980's and assess how birds from northern New England contribute to this subspecies.

## **Results**

### *Breeding Population*

Nesting American eiders increased rapidly in coastal Maine from a few pairs in the early 1900's to approximately 28,000 in 1989 (Fig. 2). According to the number of nesting pairs and number of islands used (Fig. 2), the population is increasing. However, the downward trend of the mean number of nesting pairs per island (1970 = 133, 1977 = 93, 1986 = 82, 1989 = 73) suggests a stabilizing population.

Only few hundred pairs of eiders nest south of Maine, specifically on the Isle of Shoals on the Maine-

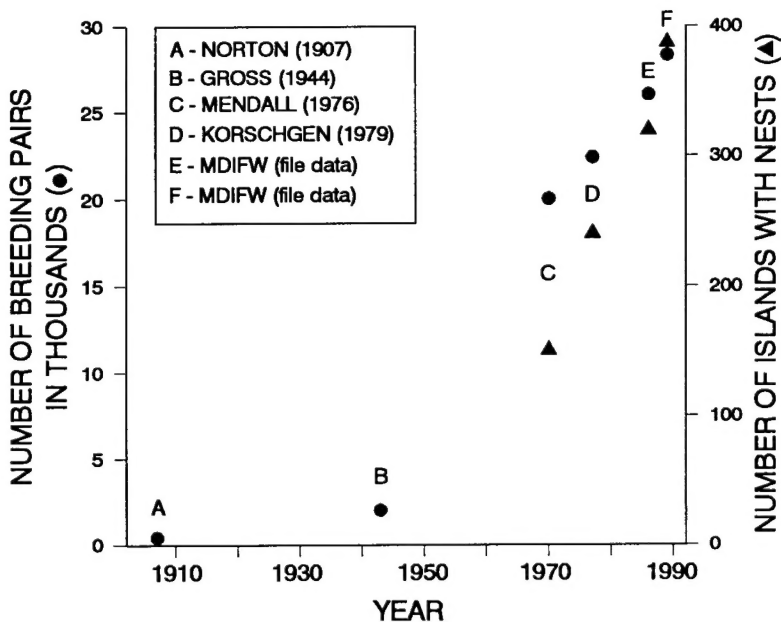


Fig. 2. Estimated numbers of American eiders (*Somateria mollissima*) nesting in Maine, 1907–1989 (MDIFW = Maine Department of Inland Fisheries and Wildlife).

New Hampshire border (Borrer and Homes 1990) and in Massachusetts where eiders were introduced in the mid-1970's (Stanton 1977, 1989).

### Wintering Population

The estimated number of American eiders wintering in the eastern United States increased steadily from approximately 59,000 in the 1960's, to over 93,000 in the 1970's, and to more than 126,000 in the 1980's (Table 1). Almost all these eiders were in Maine and Massachusetts, a few hundred were occasionally off Rhode Island, and a few birds were between coastal Connecticut and Virginia. Similar to the harvest distribution, somewhat more wintering eiders are in Massachusetts than in Maine. However, the Mid-Winter Waterfowl Survey in Massachusetts, like Maine, is done primarily of American black ducks; offshore areas are not regularly searched (H. W. Heusman, Massachusetts Division of Fisheries and Wildlife, personal communication) and hence aerial counts fluctuated widely (Table 1).

### Trends in Harvests

The estimated harvest of *S. m. dresseri* in the eastern United States increased steadily from only 3,300 in the mid-1960's to over 24,000 individuals

in the late 1980's (Table 2). Nearly all of the eider kill in the eastern United States is in Maine and Massachusetts, and the 1984–88 mean harvest was slightly higher in Massachusetts than in Maine (12,730 vs. 9,954).

Confidence intervals, if available, would be wide because the estimates are based on small sample sizes. For example, the estimated sizes of the flyway harvests for the late 1980's were based on only 130–260 common eider wings per year (1983–87,  $\bar{x}$  = 203).

Summing mean harvests and winter counts provide a reasonable estimate of the size of the fall flight in the eastern United States because the timing of the January census and the hunter harvest is such that few birds are counted twice, and there is no evidence of large-scale deaths of eiders from natural causes during the October–January period. Harvest rate indexes suggested that 5–6% of the American eiders in the fall flight in the eastern United States were shot during the 1960's (Table 3). The harvest index jumped to approximately 15% in the 1970's and remained there during the 1980's (range: 11–16%; Table 3).

### Size of Fall Flight

Available data on breeding groups, subadults, and recruitment suggest an average annual fall flight of 376,000 American eiders in eastern North America during the mid-1980's, whereas data on retrieved

Table 1. *Aerial counts of American eiders (Somateria mollissima dresseri) wintering in the United States portion of the Atlantic Flyway during early January, 1961-1988.*<sup>a</sup>

| Year | Maine (adjusted) <sup>b</sup> | New Hampshire | Massachusetts | Other states | Total   |
|------|-------------------------------|---------------|---------------|--------------|---------|
| 1961 | 1,463                         | 0             | 15,100        | 0            | 16,563  |
| 1962 | 16,302                        | 0             | 19,700        | 0            | 36,002  |
| 1963 | 21,109                        | 0             | 40,600        | tr           | 61,709  |
| 1964 | 17,347                        | 0             | 45,100        | 0            | 62,447  |
| 1965 | 49,742                        | 0             | 62,100        | 4,800        | 116,642 |
| 1966 | 17,974                        | 0             | 26,600        | 0            | 44,574  |
| 1967 | 42,218                        | tr            | 95,500        | 0            | 137,718 |
| 1968 | 54,758                        | tr            | 90,400        | 0            | 145,158 |
| 1969 | 20,691                        | tr            | 45,500        | 0            | 66,191  |
| 1970 | 16,511                        | tr            | 54,700        | 0            | 71,211  |
| 1971 | 21,945                        | tr            | 24,700        | 0            | 46,645  |
| 1972 | 46,189                        | tr            | 44,900        | 0            | 91,089  |
| 1973 | 56,012                        | 900           | 27,500        | 200          | 84,612  |
| 1974 | 62,491                        | 600           | 62,300        | 300          | 125,691 |
| 1975 | 81,301                        | tr            | 46,800        | 0            | 128,101 |
| 1976 | 41,591                        | 100           | 45,900        | tr           | 87,591  |
| 1977 | 62,909                        | 100           | 40,300        | tr           | 103,309 |
| 1978 | 48,279                        | 100           | 60,700        | 500          | 109,579 |
| 1979 | 64,581                        | 400           | 84,700        | tr           | 149,681 |
| 1980 | 76,328 <sup>c</sup>           | 700           | 98,900        | 0            | 175,928 |
| 1981 | 73,602 <sup>c</sup>           | 200           | 51,100        | 0            | 124,902 |
| 1982 | 77,926 <sup>c</sup>           | 400           | 59,400        | tr           | 137,726 |
| 1983 | 56,964 <sup>c</sup>           | 300           | 37,700        | 0            | 94,964  |
| 1984 | 64,163                        | 100           | 116,900       | tr           | 181,163 |
| 1985 | 65,417                        | 0             | 132,100       | 0            | 197,517 |
| 1986 | 55,385                        | 0             | 32,500        | 0            | 87,885  |
| 1987 | 88,616                        | 400           | 23,200        | 0            | 112,216 |
| 1988 | 92,169                        | 100           | 45,200        | 0            | 137,469 |

<sup>a</sup> Data from the Mid-Winter Waterfowl Survey, done cooperatively by the U.S. Fish and Wildlife Service and state wildlife agencies.

<sup>b</sup> Maine counts multiplied by 2.09 to adjust for areas in which birds were not surveyed (1961-1979 and 1984-1988) and to remove northern eiders (*S. m. borealis*) and intergrades (*S. m. dresseri-borealis*); see Methods.

<sup>c</sup> Complete counts minus northern eiders and intergrades (6%); see Methods.

harvest and wintering birds suggest a fall flight of 311,000 (Table 4). Data on adult and subadult survival and recruitment need verification, and much of the data for these estimates is based on onetime measures (e.g., Canadian winter counts). Furthermore, the number and composition of eider subspecies wintering in Canada, especially in Newfoundland, are based on scant information and untested assumptions (Table 4 footnotes).

## Discussion

Reed and Erskine (1986) recognized three breeding populations, later called subpopulations (Reed 1989), of American eiders as follows: the St. Law-

rence Estuary, Gulf of St. Lawrence, and Atlantic populations. Based on limited banding and other data, these breeding groups clearly share wintering areas in Nova Scotia, New Brunswick, and northern New England (Gauthier et al. 1976; Reed and Erskine 1986; Snow et al. 1990). Thus, we suggest managing the American eider as one unit, termed the western Atlantic eider population. This suggestion does not preclude use of the groups delineated by Reed and Erskine (1986), especially given that the status and management conditions for the individual groups can change rapidly (e.g., increase of nesters documented by Chapdelaine and Brousseau [1991]). However, populations of migratory birds are generally defined in terms of physically similar birds (i.e., species or subspecies) with interrelated nesting and wintering areas (Krohn and Bizeau

Table 2. Estimated number of American eiders (*Somateria mollissima dresseri*) harvested in the United States portion of the Atlantic Flyway, 1961-1988.<sup>a</sup>

| Year | Maine (adjusted) <sup>b</sup> | New Hampshire | Massachusetts | Other states | Total  |
|------|-------------------------------|---------------|---------------|--------------|--------|
| 1961 | 196                           | 0             | 800           | 0            | 996    |
| 1962 | 1,176                         | 0             | 1,300         | 0            | 2,476  |
| 1963 | 2,352                         | 0             | 1,700         | 300          | 4,352  |
| 1964 | 1,862                         | 200           | 1,200         | 200          | 3,462  |
| 1965 | 1,960                         | 0             | 1,100         | 0            | 3,060  |
| 1966 | 2,450                         | 100           | 5,300         | 400          | 8,250  |
| 1967 | 1,274                         | 0             | 2,400         | 300          | 3,974  |
| 1968 | 4,312                         | 0             | 1,500         | 100          | 5,912  |
| 1969 | 3,724                         | 1,000         | 2,300         | 0            | 7,024  |
| 1970 | 6,468                         | 0             | 7,200         | 100          | 13,768 |
| 1971 | 9,702                         | 0             | 4,900         | 0            | 14,602 |
| 1972 | 7,938                         | 0             | 9,500         | 0            | 17,438 |
| 1973 | 5,488                         | 0             | 10,500        | tr           | 15,988 |
| 1974 | 10,682                        | 500           | 10,800        | 0            | 21,982 |
| 1975 | 9,408                         | 0             | 5,200         | 0            | 14,608 |
| 1976 | 7,644                         | 0             | 10,200        | 100          | 17,944 |
| 1977 | 8,820                         | 400           | 5,000         | 100          | 14,320 |
| 1978 | 6,664                         | 700           | 7,800         | 100          | 15,264 |
| 1979 | 5,096                         | tr            | 12,300        | 300          | 17,696 |
| 1980 | 8,918                         | 0             | 9,000         | 0            | 17,918 |
| 1981 | 6,762                         | 1,300         | 14,000        | 100          | 22,162 |
| 1982 | 14,504                        | 600           | 8,600         | 0            | 23,704 |
| 1983 | 19,796                        | 0             | 11,600        | 0            | 31,396 |
| 1984 | 9,800                         | 0             | 7,500         | 0            | 17,300 |
| 1985 | 7,840                         | 400           | 17,100        | tr           | 25,340 |
| 1986 | 16,170                        | 200           | 13,400        | 1,600        | 31,370 |
| 1987 | 10,094                        | 400           | 13,500        | 0            | 23,994 |
| 1988 | 5,864                         | 49            | 12,151        | 0            | 18,064 |

<sup>a</sup> Data from U.S. Fish and Wildlife Service's Harvest Questionnaire and Wing surveys.<sup>b</sup> Maine estimates reduced by 2% to remove northern eiders (*S. m. borealis*) and intergrades (*dresseri-borealis*); see Methods.Table 3. Harvest rate indexes for fall-flight of American eiders (*Somateria mollissima dresseri*) in the United States portion of the Atlantic Flyway, 1961-1988.

| Years   | Mean harvested (A) <sup>a</sup> | Mean wintering (B) <sup>b</sup> | Harvest rate index <sup>c</sup> |
|---------|---------------------------------|---------------------------------|---------------------------------|
| 1961-64 | 2,822                           | 44,180                          | 0.06                            |
| 1965-68 | 5,299                           | 111,023                         | 0.05                            |
| 1969-72 | 13,208                          | 68,784                          | 0.16                            |
| 1973-76 | 17,631                          | 106,499                         | 0.14                            |
| 1977-80 | 16,300                          | 134,624                         | 0.11                            |
| 1981-84 | 23,641                          | 134,689                         | 0.15                            |
| 1985-88 | 24,692                          | 133,772                         | 0.16                            |

<sup>a</sup> From Table 2.<sup>b</sup> From Table 1.<sup>c</sup> Calculated as  $A + (A + B)$ . This index assumes that essentially all of the harvest occurs prior to the Mid-Winter Waterfowl Survey and negligible natural mortality occurs between October and January.

Table 4. Comparative estimates of the average size of the annual fall flight of the western Atlantic eider population (*Somateria mollissima dresseri*) during the mid-1980's.

| Breeding locations                               | METHOD I = Breeding groups + subadults + young |  | Estimated fall flight |
|--|--|--|-----------------------|
|  | Number of breeding adults (data source)        | Number of subadults and young <sup>a</sup> |                       |
| Southern Quebec                                  |  |  |                       |
| St. Lawrence Estuary                             | 37,000 (Bourget 1989)                          | 61,050                                     | 98,050                |
| Gulf of St. Lawrence                             | 10,800 (Bourget 1989)                          | 17,820                                     | 28,620                |
| Maritime Provinces                               |  |  |                       |
| Newfoundland (including Labrador S. of 55° Lat.) | 7,200 (Reed 1989 and Bourget 1989)             | 11,880                                     | 19,080                |
| Nova Scotia                                      | 16,000 (Hicklin 1989)                          | 26,400                                     | 42,400                |
| New Brunswick                                    | 14,000 (Hicklin 1989)                          | 23,100                                     | 37,100                |
| Northern New England                             |  |  |                       |
| Maine  | 56,600 (Fig. 1)                                | 93,390                                     | 149,990               |
| New Hampshire                                    | 20 (Borror and Holmes 1990)                    | 33   | 53                    |
| Massachusetts                                    | 400 (Stanton 1989)                             | 660  | 1,060                 |
| FALL FLIGHT I = 376,353                          |  |  |                       |
| Wintering locations                              | METHOD II = Harvested + wintering birds        |  | Estimated fall flight |
|  | Number harvested <sup>b</sup> (data source)    | Number wintering (data source)             |                       |
| Southern Quebec                                  | 2,216 (Dickson 1989) <sup>c</sup>              | 64,984 (Bourget et al. 1986) <sup>d</sup>  | 67,200                |
| Maritime Provinces                               |  |  |                       |
| Newfoundland (including So. Labrador)            | 7,236 (Dickson 1989) <sup>c</sup>              | 65,450 (Bourget et al. 1986) <sup>e</sup>  | 72,686                |
| New Brunswick and P.E.I.                         | 284 <sup>c</sup> (Dickson 1989)                | 2,302 <sup>f</sup> (Bourget et al. 1986)   | 2,586                 |
| Nova Scotia                                      | 5,277 <sup>c</sup> (Dickson 1989)              | 2,260 <sup>f</sup> (Bourget et al. 1986)   | 7,537                 |
| Northern New England                             |  |  |                       |
| Maine  | 12,740 <sup>g</sup>                            | 66,109 <sup>h</sup>                        | 78,849                |
| New Hampshire                                    | 200 <sup>g</sup>                               | 160 <sup>h</sup>                           | 360                   |
| Massachusetts                                    | 12,620 <sup>g</sup>                            | 68,480 <sup>h</sup>                        | 81,100                |
| Other eastern states                             | 320 <sup>g</sup>                               | tr <sup>h</sup>                            | 320                   |
| FALL FLIGHT II = 310,638                         |  |  |                       |

<sup>a</sup> See Reed and Erskine (1986:172) for the rationale of multiplying the number of adult breeders by 1.65 to estimate numbers of non-breeding subadults and fledged young.

<sup>b</sup> Conservative because not corrected for unretrieved harvest.

<sup>c</sup> Canadian harvest estimates for common eiders (*S. mollissima*) are the 1984-87 means from Dickson (1989) multiplied by 43% for Quebec and Newfoundland, and 94% for P.E.I., N.B., and N.S. These adjustments assume that the percentage of *S. m. dresseri* wintering in the Gulf of St. Lawrence (Reed et al. 1986) applies to all of Newfoundland (including Labrador) and that Mendall's (1980) finding that 94% of Maine's wintering eiders are *S. m. dresseri* applies to the other maritime provinces immediately north of Maine; see footnote f below.

<sup>d</sup> Bourget et al. (1986) counted 155,000 eiders in 1980, 97.5% of which were common eiders ( $155,000 \times 0.975 = 151,125$ ). Assuming that Reed et al. (1986) had a representative sample of eiders from the Gulf of St. Lawrence, they found that 43% of the wintering birds were *S. m. dresseri* ( $151,125 \times 0.43 = 64,984$ ).

<sup>e</sup> Bourget et al. (1986) estimated 152,210 eiders wintering in Newfoundland, including southern Labrador. It was assumed, based on Reed et al. (1986) in the St. Lawrence, that 43% of these birds were *S. m. dresseri* ( $152,210 \times 0.43 = 65,450$ ).

<sup>f</sup> Assumes 94% of wintering eiders are *S. m. dresseri* (Mendall 1980). If in fact a higher fraction of *S. m. borealis* and *borealis-dresseri* intergrades are harvested and winter in these provinces, the estimates in this table are high. However, given the relatively few birds involved, a smaller fraction of *S. m. dresseri* would not substantially alter the estimated size of the fall flight.

<sup>g</sup> From Table 2 of this study ( $\bar{x}$  for 1983-1987).

<sup>h</sup> From Table 1 of this study ( $\bar{x}$  for 1983-1987).

1980). Given that the eiders in question are all *S. m. dresseri* and thus are physically indistinguishable on shared wintering areas, we see no compelling rationale for delineating three populations, but instead propose recognizing the western Atlantic eider population as one unit with various breeding groups.

The estimated sizes of the fall flights of this study (311,000 and 376,000) are substantially higher than the 211,000 and 215,000 shown in Fig. 2 of Reed and Erskine (1986). Our higher estimates are the result of more complete information and possibly an increased population.

Winter counts of eiders are incomplete (see Methods) and harvest estimates are biased low (Wendt and Silieff 1986; Wendt 1989). Furthermore, we used harvest estimates that were uncorrected for crippling loss, which because of the eider's size and diving abilities must be substantial. Thus, we expected that the size of the fall flight based on retrieved harvest and wintering counts (Method II = 311,000) would be lower than one based on numbers of breeders, subadults, and recruitment (Method I = 376,000). Although our findings fit the predicted pattern, we note that no confidence intervals are associated with these estimates and that average annual estimates reveal little about population dynamics. These estimates only suggest the magnitude of the western Atlantic eider population in the mid-1980's, but give a fairly accurate picture of distribution during breeding and wintering seasons.

Although the numbers of eiders breeding and wintering in northern New England seem healthy, the birds' status could nevertheless change rapidly. The eider has low annual recruitment (Reed and Erskine 1986), thus the point at which hunting becomes additive to non-hunting mortality is lower in eiders than in species with relatively high annual recruitment rates (e.g., wood ducks). The preceding suggests that harvest and population levels should be more closely monitored, especially because we detected a two- to three-fold increase in harvest rates starting in the late 1960's.

Hunter interest in eiders is increasing in northern New England. For example, in Maine the percentage of eiders in the waterfowl harvest increased from 3-4% in the early 1960's to over 25% in the late 1980's. During the same period, the American black duck harvest went from over 50% to less than 20% of the annual statewide harvest. In part, how-

ever, this decrease in the American black duck harvest was intentional because regulations for harvesting black ducks were made especially restrictive.

Eiders have low recruitment and high survival (Reed and Erskine 1986), suggesting adaptation to a relatively stable environment. Thus, major changes in the birds' environment could be disastrous. The commercial harvest of blue mussels from Nova Scotia south to Massachusetts is new and growing. In Maine alone, the mussel harvest increased from approximately 0.5 million kg in 1976 to more than 2.9 million kg in 1985 (Caturano et al. 1988). Commercial harvest of green urchins (*Strongylocentrotas drobachiensis*) and periwinkles (*Littorina* spp.), the second and third most important foods of adult eiders in Maine (Korschgen 1976), has also started. The effect of increased human exploitation of the eider's major foods is unknown and, like the effects of eiders on cultured mussels (Parsons et al. 1990), deserves study.

Avian cholera, unknown in the northern (i.e., cooler) portions of the eider's range, kills significant numbers of nesters in Maine (Korschgen et al. 1978) and Quebec (Reed and Cousineau 1967). In Maine, reported cases of cholera have not increased since the 1970's (Maine Department of Inland Fisheries and Wildlife, unpublished data).

From the data reported here (except 1989), Blumton et al. (1988) concluded that the number of eiders nesting in Maine seemed to be stabilizing. With the addition of the 1989 results, one could argue that the nesting population is continuing to increase. However, the steady decline in mean number of nesting pairs per island, 1978-89, suggests a stabilizing population. Without population estimates of known reliability, we cannot conclusively determine a trend in population size from a short interval (i.e., <10 years) and only continued monitoring will conclusively answer whether or not population growth has ceased.

Assessing the status of *S. m. dresseri* requires more data on the seasonal distribution, especially in regard to the distribution of *S. m. borealis* and *dresseri-borealis* (also see Mendall 1986). This need applies to harvested birds as well as wintering birds. Distinguishing subspecies becomes more critical in the northern portion of *S. m. dresseri*'s range where relatively more northern eiders and intergrades winter. Reliable data on annual numbers of wintering eiders by subspecies, especially



in eastern Canada, are needed (also see recommendations in Drolet [1989]). In 1990–91, the U.S. Fish and Wildlife Service conducted experimental aerial counts along the Atlantic coast in an attempt to develop a survey of known reliability of wintering sea ducks. If feasible, these inventories need to be continued.

Over two decades ago, Mendall (1976) noted that although numbers of eiders nesting in coastal Maine were high, we should not be complacent. This warning is even more applicable today. Better collection of data on populations and habitats with which to manage the western Atlantic eider population would be prudent. Until more reliable data are available from across the range of *S. m. dresseri*, it will be impossible to set goals similar to those currently in the North American Waterfowl Management Plan for other waterfowl populations.

## Conclusions

1. The American eider is a marine duck that nests from central Labrador to Quebec's St. Lawrence region and south to Massachusetts. In the mid-1980's, the nesting population of about 71,000 pairs was distributed approximately as follows: Quebec = 34%, Newfoundland (including southern Labrador) = 5%, Nova Scotia = 11%, New Brunswick = 10%, Maine = 40%, and New Hampshire and Massachusetts < 1%.
2. According to reported recoveries, eiders banded on geographically distinct breeding areas were often found in the same wintering area (e.g., nesting females banded in Quebec and Maine were shot during winter in coastal Maine). Thus, we propose managing this subspecies as a single unit, termed the western Atlantic eider population. However, the need for additional banding on nesting areas to determine harvest distribution and magnitude and the relations between breeding and wintering grounds remain high priorities (Reed 1986, Drolet 1989, Snow et al. 1990).
3. Wintering eiders are not counted annually in eastern Canada and, even when counted, how many of the birds are *S. m. dresseri* or *S. m. borealis* is uncertain. In the eastern United States, where less than 6% of the wintering eiders are *borealis* and intergrades, the number of American eiders have steadily increased from approximately 59,000 per year in the 1960's to over 126,000 in the 1980's, suggesting an overall population increase.
4. Hunter interest in the American eider is increasing, especially in coastal Maine and Massachusetts. Available data suggest that the annual harvest of eiders in the eastern United States increased from 3,300 in the mid-1960's to over 24,000 in the late 1980's. In the eastern United States, the annual harvest jumped from 5–6% of the birds of the fall flight in the 1960's to approximately 15% in the 1970–80's. Although no evidence exists of current detrimental harvest, low recruitment and long adult life of this species suggest that the hunting will become additive to total mortality at a level lower than in most inland ducks.
5. Coastal development is increasing and thus eider habitat needs to be more carefully assessed and monitored. The three main foods of adult eiders (i.e., blue mussels, green urchins, and periwinkles) are now harvested commercially in northern New England and mussel aquaculture is growing in eastern Canada and northern New England. Depredation of mussels by eiders is an increasing concern, especially in Maine and Nova Scotia, and deserves more study.
6. Although the western Atlantic eider population seems to be stable to slowly increasing, this is not a time for complacency. The eider's habitat, including its major foods, is increasingly being used for commercial purposes. To set realistic and usable management goals, annual and reliable data are needed on the numbers of breeding, wintering, and harvested American eiders. These data should be comparable across the subspecies' range so that population change can be more fully assessed.

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